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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/934,293	08/21/2001	Naoya Hasegawa	9281-4158	8310

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EXAMINER	
OMETZ, DAVID LOUIS	
ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 03/24/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/934,293	HASEGAWA, NAOYA	
	Examiner	Art Unit	
	David L. Ometz	2653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. The drawing corrections were received on 1/8/04 and have been approved by the examiner. Formal drawings are now required (i.e. non-red-lined drawings) for drawing pages 18 and 20.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-5, 8, 9, 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakamoto et al (US Pat 5936810).

As per claim 1, Nakamoto et al shows a spin valve thin film magnetic element in figure 3 comprising: a pair of nonmagnetic conductive layers 20/34, a pair of pinned magnetic layers 22,24/36,38, and a pair of antiferromagnetic layers 16/40 for respectively pinning the magnetization directions of the pair of pinned magnetic layers, which are laminated in turn on both sides of a free magnetic layer 18 in the thickness direction to form a laminate on a substrate; a pair of bias layers 28 located on both sides of the laminate in the track width direction, for orienting the magnetization direction of the free magnetic layer in the direction crossing the magnetization direction of each of the pinned magnetic layer:; and a pair of lead layers 14 laminated on the bias layers, for supplying a sensing current to the laminate; wherein of the pair of antiferromagnetic layers, at least the antiferromagnetic layer 40 apart from the substrate is made narrower than the free magnetic layer 18 in the track width direction to form lead connecting portions of the laminate on both sides of the narrow antiferromagnetic layer 40 in the track width direction; and the pair of lead layers are extended from both sides of the laminate in

the track width direction to the center of the laminate and connected to the laminate through the pair of lead connecting portions; wherein the laminate has a pair of notch portions (the concave tapering of the sides of the laminate in figure 3) formed on the side apart from the substrate, and the pair of lead connecting portions are positioned in the notch portions at both ends of the laminate in the track width direction.

As per claim 2, Nakamoto et al shows a spin valve thin film magnetic element wherein in addition to the narrow antiferromagnetic layer 40, at least a portion or the whole of the pinned magnetic layer 36,38 adjacent to the antiferromagnetic layer is made narrower than the free magnetic layer 18 to form lead connecting portions of the laminate on both sides of the narrow antiferromagnetic layer and pinned magnetic layer, and the pair of lead layers are extended from both sides of the laminate in the track width direction to the center thereof and connected to the laminate through the pair of lead connecting portions.

As per claim 3, Nakamoto et al shows wherein in addition to the narrow antiferromagnetic layer 40, the pinned magnetic layer 36,38 adjacent to the narrow antiferromagnetic layer and a portion the nonmagnetic conductive layer 34 adjacent to the pinned magnetic layer are made narrower than the free magnetic layer 18 to form lead connecting portions of the laminate on both sides of the narrow antiferromagnetic layer, pinned magnetic layer and nonmagnetic conductive layer, and the pair of lead layers are extended from both sides of the laminate in the track width direction to the center thereof and connected to the laminate through the -pair of lead connecting portions.

As per claim 4, Nakamoto et al shows the width of each of the lead connecting portions in the track width direction is in the range of 0.03 to 0.5 microns ("0.5 microns", see col. 9, lines 25-28).

As per claim 5, Nakamoto et al shows wherein the pair of bias layers 28 are adjacent to the free magnetic layer 18 to be located at the same layer position as at least the free magnetic layer, and the upper surfaces of the pair of bias layers are joined to the laminate so that only the pair of lead layers are connected to the pair of lead connecting portions.

As per claim 8, Nakamoto et al shows wherein of the pair of antiferromagnetic layers, the antiferromagnetic layer 16 located near to the substrate is formed to extend beyond the free magnetic layer 18 in the track width direction so that the bias layers 28 are laminated on the extensions of the antiferromagnetic layer 16.

As per claim 9, Nakamoto et al shows wherein the bias layers 28 are laminated, through bias underlying layers 30 made of Ta or Cr, on the extensions of the antiferromagnetic layer 16 located near to the substrate.

As per claim 12, Nakamoto et al shows wherein the laminate comprises an inherent central sensitive zone which has high reproduction sensitivity and can substantially exhibit a magnetoresistive effect, and inherent outer dead zones which are formed on both sides of the sensitive zone in the track width direction and have low reproduction sensitivity, and which cannot substantially exhibit the magnetoresistive effect; and wherein the pair of lead connecting portions formed at both ends of the laminate are formed on the dead zones of the laminate, and the pair of lead layers 14 are formed to extend from both sides of the laminate in the track width direction to the dead zones and to adhere to the laminate.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 6, 7, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto et al in view of Lin et al (US Pat 6175477). Nakamoto et al shows a laminated spin valve sensor as noted above. However, Nakamoto et al does not show wherein each of the pair of the pinned magnetic layers comprises a laminate of at least two ferromagnetic layers and a nonmagnetic intermediate layer inserted between these ferromagnetic layer wherein one of the ferromagnetic layers is thicker than the other, and the magnetization directions of the adjacent ferromagnetic layers are antiparallel to each other to bring the whole pinned magnetic layer into a ferrimagnetic state. Nakamoto et al also does not show wherein each of the pair of antiferromagnetic layers comprises any one of XMn alloys and PtX'Mn alloys (wherein X represents one element selected from Pt, Pd, Ir, Rh, Ru, and Os, and X' represents at least one element selected from Pd, Cr, Ru, Ni, Ir, Rh, Os, Au, Ag, Ne, Ar, Xe and Kr).

Lin et al '477 shows a spin valve sensor in figure 9 that has a pinned magnetic layer 920 comprising a laminate of at least two ferromagnetic layers 922/924 and a nonmagnetic intermediate layer 926 inserted between these ferromagnetic layer:, and the magnetization directions of the adjacent ferromagnetic layers are antiparallel to each other to bring the whole pinned magnetic layer into a ferrimagnetic state. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the pinned layers of

Nakamoto et al with the synthetic antiferromagnetic (SAF) pinned layer taught by Lin et al '477 as doing this would reduce the amount of detrimental stray magnetization reaching the free layer because of the "closed loop" design of the SAF pinned layer. With regard to the thickness of one of the ferromagnetic layers being greater in thickness than the other ferromagnetic layer, the examiner takes Official notice that the use of one ferromagnetic layer being thicker than the other ferromagnetic layer in the ferro/nonmag/ferro synthetic pinned layer is old and well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make one of the ferromagnetic layers thicker in Lin et al as doing this provides a slight bias in the head to help offset bias imperfections present in the head.

Lin et al '477 also discloses at col. 9, lines 24-28 the pinning antiferromagnetic layer being made of PtMn. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an antiferromagnetic substance such as PtMn because of the excellent antiferromagnetic properties and corrosion resistance of PtMn. Stable pinning of the pinned layer through exchange coupling with the PtMn antiferromagnetic layer will prevent unnecessary and harmful "pin relaxation" of the pinned layer.

6. Claim 10 is are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto et al in view of Lin et al (US Pat 6185078). Nakamoto et al shows a laminated spin valve sensor as noted above with an underlayer of Ta placed below the hard magnetic bias layers. However, Nakamoto et al does not show wherein intermediate layers made of Ta or Cr are respectively laminated between the bias layers and the lead layers.

Lin et al '078 shows a spin valve sensor in figure 11 that has intermediate layers 250/254 made of Ta which are respectively laminated between the bias layers 252 and the lead layers

256. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place Ta between the bias layers and the lead layers as doing this would aid in the growth morphology of the subsequent layers (i.e. the growth of the hard magnetic bias layer will benefit from the underlayer of Ta, while the growth of the lead layer will benefit from the other underlayer of Ta). The use of Ta underlayers in the longitudinal biasing/lead sections spin valve heads is old and well known in the art.

7. Applicant's arguments filed 1/8/04 and attached to paper number 7 have been fully considered but they are not persuasive.

Applicant asserts on page 11 that Nakamoto et al does not show the newly amended feature of wherein the laminate has a pair of notch portions formed on the side apart from the substrate, and the pair of lead connecting portions are positioned in the notch portions at both ends of the laminate in the track width direction. However, the examiner maintains that Nakamoto et al shows in figure 3 a laminate which has a pair of notch portions (the concave tapering of the sides of the laminate in figure 3) formed on the side apart from the substrate, and the pair of lead connecting portions (tips of leads 14) are positioned in the notch portions at both ends of the laminate in the track width direction.

Applicant further asserts on page 14 that there is no motivation to combine the teachings of Lin I with Nakamoto et al. However, the examiner maintains that the replacement of single or dual layered pinned layers (dual layers 36/38 in the case of Nakamoto et al) with a synthetic ferromagnetic tri-layer would have been well within the skill of a routineer in the art of magnetoresistive heads. Single, double and tri-layered pinned layers are all old and well known in the art if spin valve MR heads. The motivation to combine the references being the reduction

in the amount of detrimental stray magnetization reaching the free layer because of the "closed loop" design of the SAF pinned layer taught by Lin I.

Applicant further asserts on page 15 that there is no motivation to combine the teachings of Lin II with Nakamoto et al. It is the examiner's position that Lin et al '078 shows a spin valve sensor in figure 11 that has intermediate layers 250/254 made of Ta which are respectively laminated between the bias layers 252 and the lead layers 256. A routineer in the art of MR heads would have found it obvious to place Ta between the bias layers and the lead layers as doing this would aid in the growth morphology of the subsequent layers (i.e. the growth of the hard magnetic bias layer will benefit from the underlayer of Ta, while the growth of the lead layer will benefit from the other underlayer of Ta). The references are deemed properly combinable due to their being in the same field of art, and therefore, the rejection has been maintained.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Ometz whose telephone number is (703) 308-1296. The examiner can normally be reached on M-W, 6:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (703) 305-6137. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4750.

David L. Ometz
Primary Examiner
Art Unit 2653

DLO
3/22/04